Remarks

Reconsideration of the subject application is requested in view of the foregoing amendments and the following remarks.

Claims 1-6, 15-17, and 38-42 are pending. In this paper, claims 1 and 15 are amended, claim 17 is canceled without prejudice, and claims 2-6, 16, and 38-42 are unchanged. Claims 7-14, 18-37, and 43-46 were previously withdrawn as noted in the Office action.

The amendments to the specification are to correct readily discernible errors that were discovered during a re-reading of the specification prefatory to preparing this response.

Claim 1 is amended to clarify that the first time instant is during the period in which the substrate is being held on the adhesion surface, and to clarify that evacuation of the heat-transfer gas from the channel is commenced at a second predetermined time instant during execution of the fabrication process. See specification, page 25, lines 18-22. Claim 1 also is amended to clarify that the channel provides a conduit for the heat-transfer gas such that, as the gas flows in the channel, the gas contacts and removes heat from the downstream-facing surface of the substrate. See, *e.g.*, FIGS. 1 and 4.

Claim 15 is amended to add the text of claim 17 (resulting in cancellation of claim 17), and to add text that is similar to certain corresponding text in claim 1.

Applicants thank the examiner for performing the search in connection with the subject Office action.

Claims 1-6 and 15-17 stand rejected for alleged obviousness from a combination of Matsuda and Parkhe. This rejection is traversed.

The pending claims are directed to, *inter alia*, a solution to the following problem (page 2, lines 7-20, of the specification):

> A disadvantage of the conventional scheme noted above is the propensity of the heat-transfer gas to leak from the HTG channels into the vacuum chamber whenever a wafer currently mounted to the chuck is being removed for replacement with a new wafer. The consequent release of the heat-transfer gas into the vacuum chamber causes a temporary disruption of the vacuum level inside the lens column of the microlithography apparatus. These disruptions of the vacuum level reduce the overall stability of the microlithography apparatus. To reduce the vacuum-disrupting effect, it is necessary to evacuate the heat-transfer gas from the HTG channels for a sufficient time before the processed wafer is removed from the wafer chuck. Evacuation must continue until the vacuum level in the HTG channels is substantially the same (within a specified

> tolerance) as in the vacuum chamber. Then, the current wafer can be removed from the adhesion surface and replaced with a new wafer. Unfortunately, this gas-evacuation step requires time to execute and hence reduces throughput.

In other words, the gas-evacuation step conventionally is performed after completion of the process on the wafer, which substantially reduces throughput of the conventional process (page 2, lines 21-25 of the specification):

> The time required to perform evacuation of the heat-transfer gas from the HTG channels can be substantial (e.g., 15 seconds). The long time is a result of various causes, including the fact that the HTG channels typically are very narrow. Narrow channels normally require considerable time to evacuate by conventional methods.

Claim 1 is directed to substrate-holding devices for holding a substrate while a fabrication process is being performed on the substrate. The device comprises a wafer-chuck body defining an adhesion surface. The adhesion surface defines a channel that is configured, whenever the substrate is adhered to the adhesion surface, to provide a conduit for a heat-transfer gas. As the gas flows in the channel, the gas contacts and removes heat from the downstream facing surface of the substrate. Each such device includes a controller. At a first predetermined time instant during the period in which the substrate is being held on the adhesion surface, the controller commences the process to be performed on the substrate. At a second predetermined time instant during execution of the process, the controller commences evacuation of the heat-transfer gas from the channel.

The Office action contends that Matsuda discloses a substrate-holding device including an HTG channel as claimed. This contention is incorrect. In Matsuda, the heat-transfer gas is discharged at the substrate perpendicularly through holes in the surface of the chuck. See FIGS. 1 and 2, and col. 1, lines 44-47; col. 4, lines 55-64. No other manner is disclosed or suggested in Matsuda of contacting the wafer with a heat-transfer gas. Hence, Matsuda does not teach or suggest an adhesion surface defining a channel that is configured as recited in claim 1.

Furthermore, in Matsuda the heat-transfer gas is removed only after completion of the process being performed on the wafer. See, *e.g.*, col. 2, lines 38-46, which specifically and clearly states that evacuation of the heat-transfer gas commences only after plasma processing of the wafer has been completed. See also col. 6, line 47.

Furthermore, since Matsuda does not disclose HTG channels in contact with the underside of the substrate in the manner instantly claimed, Matsuda is not concerned with the problem of evacuating heat-transfer gas from channels that would be open to large-scale dumping of heat-transfer gas into the surrounding environment the instant the substrate is removed from the chuck. Rather, Matsuda is concerned with avoiding entraining of dust from the under-surface of the wafer. Col. 3, lines 39-45 and 60-65. In this regard, Matsuda teaches connecting the gas-supply line and gas-evacuation line mutually with a bypass line that facilitates supply and evacuation of heat-transfer gas from both lines. Col. 4, lines 14-22 and 43-54. These features in Matsuda are not what are instantly claimed, do not address the same problems as the instant claims, and do not suggest the instantly claimed combinations of features.

Parkhe was cited in the Office action for its alleged disclosure of a controller. Applicants point out that any disclosure in Parkhe of a controller does not fulfill any of the deficiencies of Matsuda. Without question, Parkhe does not anticipate all controllers and does not render all controllers obvious. The controller of Parkhe performs none of the specific functions, noted above, performed by the controller in claim 1, and there is no disclosure or suggestion in Parkhe of configuring a controller to perform all the instantly claimed tasks. In Parkhe a backside gas is turned off before chucking voltage is turned off to prevent the wafer from floating off the chuck. Col. 5, lines 19-21. After the plasma is ignited a chucking voltage can be applied to chuck electrodes and backside gas, if required, can be turned on. Col. 5, lines 39-42. This sequence is reversed after the plasma process is completed. Col. 5, lines 60-67. Hence, there is no disclosure or suggestion in Parkhe of the specific problem addressed by claim 1 and its dependents, and no teaching or suggestion of how to solve such a problem.

The Office action contends, "Regarding claim 4 as the configured process step finishes at the end of process step [presumably in Parkhe] its duration is at least 80% of process time." This comment is not understood since no citation is provided. Furthermore, no sense can be made of it as written. Furthermore, it appears to be irrelevant in view of the other shortcomings of Parkhe.

The Office action contends, "Claims 6 and 16 are not patentable as being directed to an intended use. The controller as disclosed by Matsuda et al and improved by Parkhe would be capable of controlling the sequence of any process." [Emphasis added.] This contention is emphatically traversed. No controller known to man and configured in a particular manner is capable of "controlling the sequence of any process." The contention in the Office action flies in

the face of the fact that an unlimited number of controllers exists for an equally unlimited number of tasks. The contention also flies in the face of the fact that, in modern technology, more R&D time, man-hours, and money is expended in the development of controllers (and hardware and software for running them) for specific applications than for perhaps any other purpose. The contention in the Office action insults the enormous amount of inventive activity and insight contributed by countless very talented individuals who participate in these efforts.

Therefore, claims 1-6 are not obvious from any conceivable combination of Matsuda and Parkhe, and withdrawal of the rejection is requested.

Claim 15 as amended requires, *inter alia*, that the subject wafer chuck comprise an adhesion surface that defines a channel that is enclosed whenever a sensitive substrate is mounted to the wafer chuck. Also, the subject wafer chuck includes an electrode that attracts the substrate such that, as the substrate is held on the chuck with the downstream-facing surface of the substrate contacting the adhesion surface, the channel is enclosed.
Neither Matsuda nor Parkhe, alone or in combination, discloses or suggests such an adhesion surface or the enclosing of a channel. (See relevant discussion above.) Claim 15 as amended also includes a controller that has many of the features as recited in claim 1. Such a controller is not taught or suggested by any combination of Matsuda and Parkhe for reasons as discussed above regarding claim 1.

Therefore, claims 15 and 16 are not obvious from any conceivable combination of Matsuda and Parkhe, and withdrawal of the rejection is requested.

Claims 38-40 and 42 stand rejected for alleged obviousness from Shamouilian in view of Onishi. This rejection is traversed.

The Office action admits that Shamouilian fails to disclose a filter configured as a cold trap. Onishi is cited for its alleged disclosure of "use of cold trap to remove harmful gases from the exhaust gas to make it clean and recycle to the chamber and valve to isolate from chamber so as to remove the impurities by exhausting . . . ." In traversing the rejection, it is pointed out that claim 15 addresses the following problem (specification page 2, line 26 to page 3, line 15):

> In addition, trace amounts of impurities (e.g., H_2O, contaminant gases, etc.) typically are present in the conduits through which the heat-transfer gas is supplied to the HTG channels between the wafer and the adhesion surface. Also, trace amounts of impurities typically are present in the heat-transfer gas itself. H_2O (water vapor) is a problem because the presence of this gas prevents

> increasing the vacuum in the vacuum chamber to a desired level. An exemplary contaminant gas is CO_2, which tends to precipitate solid contaminants such as carbon and organic substances inside the vacuum chamber, especially on electromagnetic lenses and the like through which the charged particle beam passes as the beam propagates through the lens column of the microlithography apparatus. These contaminants can have any of various adverse effects. For example, contaminant deposits in the column can become charged electrostatically as they encounter charged particles of the beam. The charged deposits can impart an undesired deflection of the charged particle beam as the beam propagates through the column. In general, these adverse affects tend to reduce the accuracy of pattern transfer.
>
> Again, to prevent or reduce problems associated with these contaminants, it is necessary to evacuate the HTG channels between the wafer and the adhesion surface of the wafer chuck for a sufficient time before exchanging wafers. As noted above, the channel-evacuation time tends to reduce throughput. Also, evacuated and used heat-transfer gas (which is expensive) conventionally is discarded, resulting in increased operating expense of the microlithography apparatus.

There is nothing in Shamouilian indicating any awareness of these problems. Hence, there is nothing in this reference that would lead the skilled person to seek a cold trap for any purpose, and certainly not for the purpose of solving the problem above. Rather, in Shamouilian, heat-transfer gas simply is supplied from a source and exhausted through an exhaust port.

Onishi provides no teaching or suggestion whatsoever of the use of a heat-transfer gas for any purpose, provides no teaching or suggestion the problem of reducing or controlling contaminants in a heat-transfer gas, and provides no teaching or suggestion of using a cold trap or any other appliance to remove impurities from a heat-transfer gas. Rather, Onishi discloses the use of a cold trap simply for removing harmful substances from an exhaust gas produced by performing an industrial process, so as to allow recirculation of the exhaust gas. This is not what is claimed and does not lead to what is claimed.

Therefore, claims 38-40 and 42 are not obvious from any conceivable combination of Shamouilian and Onishi.

The allowability of claim 41 is noted.

Applicant has a right to an interview at this stage of prosecution. If any issues remain unresolved after consideration of the contents of this paper, the examiner is requested to contact the undersigned to schedule a telephonic interview. Any inaction by the examiner to make such

contact, followed by issuance of a final action, will be regarded as an acquiescence by the examiner to grant an interview as a matter of right after the final action.

Respectfully submitted,

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